Introduction to Blocks

Damien Cassou, Stéphane Ducasse and Luc Fabresse

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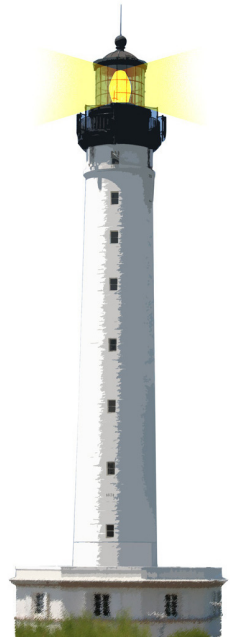
Pharo

http://www.pharo.org



Blocks

Blocks are:

- kind of anonymous methods
  - also called (lexical) closures
- used everywhere in Pharo
  - loops, conditionals, iterators, ...
  - GUI frameworks, DSLs, ...
  - at the heart of the system
- just introduced in Java 8.0

Block Definition

A block is **defined** by [ ]

```
[ expressions. ... ]
```

Block Definition Does not Execute Code

- Executing code may signal an Error

```
(1/0)
—> Error
```

- But, no error when **defining** a block
  - a block definition does not execute its body
  - a block definition freezes its body computation

```
[1/0]
>[1/0]
```

```
[1/0].
1+2
>3
```

Executing a Block

Executing a block is done **explicitly** through value

```
[ 2 + 6 ] value
> 8
```

```
[ 1 / 0 ] value
> Error
```

A Block with 1 Argument

A block can take arguments (just like methods)

```
[ :x | x + 2 ]
```

- [ ] delimits the block
- :x is a block argument
- x + 2 is the block body

```
[ :x | x + 2 ] value: 5
> 7
```

- value: 5 executes the block with 5 as argument
  - x is 5 during the block execution

Block Execution Value

Block execution returns the value of the last expression

```
[ :x |
  x + 33.
  x + 2 ] value: 5
> 7
```

Blocks can be Stored

- A block can be stored in a variable
- A block can be evaluated multiple times

```
| add2 |
add2 := [ :x | x + 2 ].

add2 value: 5.
> 7

add2 value: 33
> 35
```

Defining a Block with 2 Arguments

Example:

```
[ :x :y | x + y ]
```

:x :y are block arguments

How to execute a block with two arguments?

```
[ :x :y | x + y ] ??? 5 7
> 12
```

Executing a Block with 2 Arguments

```
[ :x :y | x + y ] value: 5 value: 7
> 12
```

- value: 5 value: 7 evaluates the block with 5 and 7
  - x is 5 and y is 7 during the block evaluation

A Block with Temporary Variables

Blocks can define temp. variables (just like methods)

```
Collection>>affect: anObject when: aBoolean
 self do: [ :index | | args |
  args := ....
  aBoolean
   ifTrue: [ anObject do: args ]
   ifFalse: [ anObject doDifferently: args ] ].
```

- | args | defines a temporary variable named args
- args exists only during block evaluation

Returning from a Block Returns from the Method

When a return ^ is executed in a block, computation exits the method defining the block

```
Integer>>factorial
  "Answer the factorial of the receiver."

  self = 0 ifTrue: [ ^ 1 ].
  self > 0 ifTrue: [ ^ self * (self – 1) factorial ].
  self error: 'Not valid for negative integers'
```

```
0 factorial
>1

42 factorial
>1405006117752879898543142606244511569936384000000000
```

A Design Advice

- Use blocks with 2 or 3 arguments maximum
- Define a class instead of a block for more arguments
- A block encapsulates only 1 computation
  - it cannot define more facets (e.g., printing)

Summary on Blocks

```
[ :variable1 :variable2 ... |
  | tmp |
  expression1.
  ... variable1 ...
] value: ... value: ...
```

- Kind of anonymous method
- Technically lexical closures
- Can be stored in variables and method arguments
- Basis of conditionals, loops and iterators (see companion lectures)
- Further readings: `http://deepintopharo.org`

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